Make Your Own Front Panels

Professional design using simple tools

by V. Schmidt

Making front panel layouts (for use in machining blank panels) and generating foils for front panels do not impose particularly heavy demands on either the PC itself or the drawing program. As a rule, any drawing program that allows multiple layers to be simultaneously displayed and edited is fully adequate.

Some examples of suitable programs are Designer 3.1 and Draw (both from MicrografX), CorelDraw 3 (from Corel) and AutoCAD.

Usually, the drawing program determines the requirements for the hardware. A 33-MHz 386 processor is adequate for somewhat older software, but modern programs will need a Pentium with at least 16 MB of working memory. Graphics software is usually very computation intensive and thus requires a relatively large amount of memory.

The printer should have a resolution of at least 300 x 300 dpi, although is not important whether you use a laser printer or a colour ink-jet printer. The paper transport mechanism should be able to handle the thickness of the foil stock, and preferably the paper path through the printer should not be too convoluted.

Special printer paper can be used as a base for the foil, and in addition you will need a clear acrylic lacquer spray for sealing the colour inks or toner.

To finish the job, you only need a paper cutter or paper knife (a scalpel is ideal), scissors and a steel ruler. These tools can be used to cut the foil to size and make cutouts. A prick punch can be used to transfer the locations of drilled holes and the corners of cutouts to the front panel. The mechanical work on the front panel can be done using an electric drill, a milling machine and files. A miniature drill with a milling accessory is very suitable for doing the milling work.

Figure 1. Front panel outline.

Preparations

We can use a small project to illustrate the generation of a front-panel foil and machining the front panel. Our panel will be fitted with a six-position rotary switch, a pushbutton switch, a four-position slide switch, two 5-mm LEDs and two 4-mm panel-mounted jacks.

Before starting the design, you should have a clear idea of the number, dimensions and shapes of all drilled holes and cutouts. Use slide callipers to make the necessary measurements. Only then can you start with the design on the PC.

The scale of the drawing program should be set to 1:1. This can be done with most programs via a menu item. The resolution of the drawing grid should not be set larger than 0.25 mm per division. Make the drawing on a blank page, rather than using a template with pre-defined borders.

Graphic design

Make the drawings using three to four layers, as follows:

The outline drawing (layer 1)
The first layer contains the outline of the front panel (see **Figure 1**). This establishes the area that is available for placing the controls and indicators, and at the same time it provides the basis for the dimensioning and layout of the front panel foil.

The dimensional drawing (layers 2 and 3)
The dimensional drawing contains all the mechanical details needed for machining the front panel. It shows the centres and diameters of all drilled holes and the centres and outlines of all cutouts. In preparing these drawings, take care that the outlines of rotary switches and potentiometers do not extend past the edges of the panel.

The information needed to machine the front panel should be readily evident from the dimensional drawing. In this regard, it is a good idea to provide separate layers for the outlines and the dimensions. **Figure 2** shows the drilled holes for the rotary switch and jacks (10 mm diameter), the two LEDs (6.5 mm) and the pushbutton switch (6 mm), as well as the cutout for the slide switch along with its fixing holes. These features can later be transferred to the front panel plate using a prick punch.

The front-panel foil graphic design (layer 4)
The third step is the graphic design of the front-panel foil. This contains items such as scales, labels, the model and number of the equipment and so on. Background colour patches, used for example to highlight control elements, are also placed here. You should display the other layers to allow the graphic elements to be correctly positioned. If you also merge in the centre crosses for the drilled holes and cutouts, the subsequent mechanical finishing of the foil will be easier. When doing this, make sure that the layer containing the graphic elements is to the front.

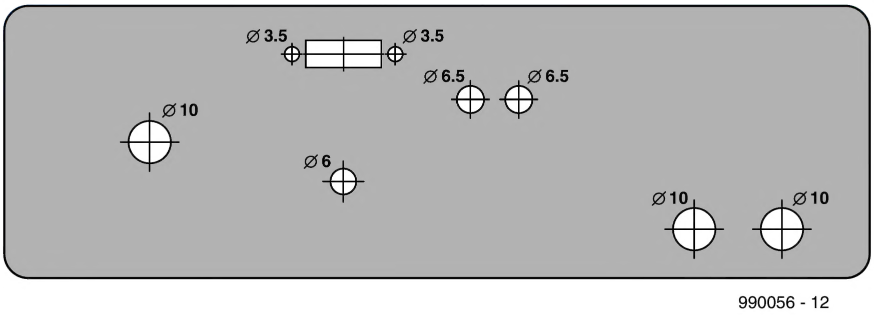

Figure 2. Dimensional drawing showing drilled holes and cutouts.

In our particular example, a scale with six marked positions is needed for the rotary switch, to indicate the number of batteries. The angle between adjacent positions is 30 degrees. A linear scale with suitable divisions is placed alongside the slide switch, which controls the charging current.

The status display, with its two LEDs, is located in a separate region of the panel. This also contains explanations of the various operating states. The polarity of the output jacks is indicated. Every element of the front foil has a descriptive label, which makes operation easier.

Outlines are placed around each of the most important elements, to emphasize their significance. The model identification of the device also belongs on the front panel.

Printing

Two different printouts are needed for making a finished front panel: the dimensional drawing, used for the machining of the front panel, and the actual front-panel foil.

The dimensional drawing can be printed on normal paper, while the choice of medium for printing the foil depends on the capabilities of the printer. Normal paper can be used with a laser printer, but special paper must be used with an ink-jet printer to obtain sufficiently sharp edges and optimum colour brilliance.

Layers 1 through 3 are printed out to produce the dimensional drawing, while layers 1, 2 and 4 are printed to produce the foil. The subsequent processing steps are different for the dimensional drawing and the foil. The dimensional drawing can be cut to size and laid aside, while the foil must be inspected to be sure that it is perfectly clean and free of dust. After this, the foil print is sprayed with a lacquer coating. The lacquer must be applied in short bursts, to prevent the ink or toner from dissolving in lacquer and smearing. Apply the lacquer in several coats if necessary. Following this, allow the coated foil to dry thoroughly for at least three hours.

After this, you can cut the foil to size and make all the necessary openings, using scissors and a paper cutter. This completes the preliminary work that is necessary before starting with the machining of the front panel.

Machining the front panel

First, attach the dimensional drawing (which has been cut to size) to the front panel using

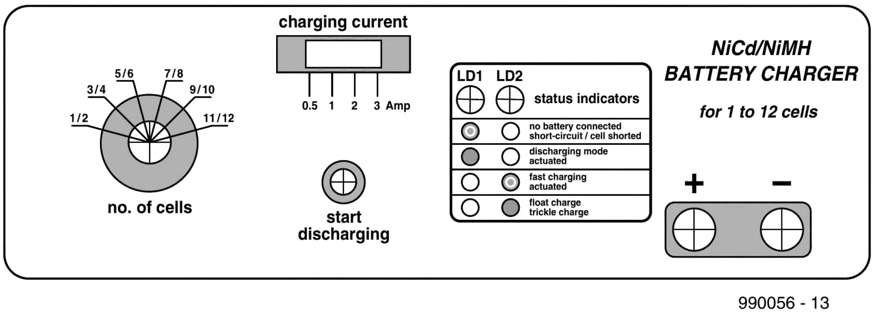

Figure 3. The finished front-panel foil design.

adhesive tape. Mark the centres of drilled holes and the corners of cutouts using a prick punch. Connect the corner points using a scriber and a steel rule or draughting triangle. After the mechanical work with the drill, milling machine and other tools has been completed, the dimensional drawing can be removed. Check all holes and cutouts using callipers, in order to avoid any unpleasant surprises when the foil is attached to the panel.

This manner of working eliminates the possibility of mistakes in the drafting of the front panel layout, since the dimensional drawing and the foil layout are generated and defined in a single drawing.

If you want to use hidden screws with the front panel, the components that are mounted using these screws must be fixed to the panel before the foil is attached. The foil can subsequently be attached to the machined front panel using a suitable adhesive with a moderately long setting time. Once the foil is properly positioned, secure it with adhesive tape or clamps to prevent it from slipping. When the glue has hardened, you can start with mounting the controls and indicators. **Figure 4** shows a cross section of the sample front panel, including a potentiometer with a knob.

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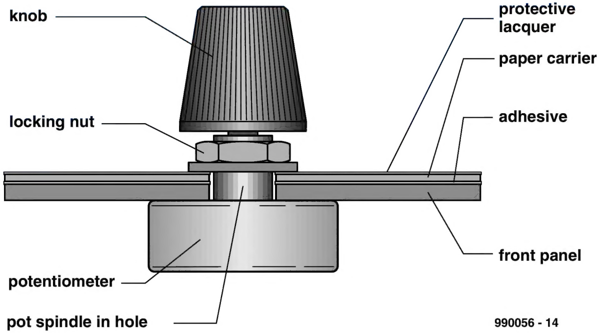

Figure 4. Cross-sectional view of the fully-assembled front panel.